

CLAIMS

What is claimed is:

1. A device comprising:  
a backlight for a color liquid crystal display, said backlight comprising:  
5           at least one light guide having a first surface, an opposing second surface,  
and a plurality of edges;  
              at least one red light emitting diode (LED) optically coupled to a first edge  
of said light guide;  
              at least one green LED optically coupled to a second edge of said light  
10       guide; and  
              at least one blue LED optically coupled to a third edge of said light guide,  
said light guide including light directing elements, a first set of light  
directing elements causing light entering said first edge to be directed to exit said  
first surface in areas corresponding to red pixels in said display, a second set of  
15       light directing elements causing light entering said second edge to be directed to  
exit said first surface in areas corresponding to green pixels in said display, and a  
third set of light directing elements causing light entering said third edge to be  
directed to exit said first surface in areas corresponding to blue pixels in said  
display.  
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2. The device of Claim 1 further comprising:  
a plurality of layers including a liquid crystal layer.
3. The device of Claim 1 wherein said light directing elements are  
25       deformities in a surface of said light guide.
4. The device of Claim 3 wherein said deformities include ridges in said light  
guide.
- 30       5. The device of Claim 4 wherein,  
said first set of light directing elements include ridges having angled surfaces for  
receiving light entering said first edge;

said second set of light directing elements include ridges having angled surfaces orthogonal to said angled surfaces of said first set of light directing elements surfaces for receiving light entering said second edge; and

5        said third set of light directing elements include ridges having angled surfaces orthogonal to said angled surfaces of said first set and said second set of light directing elements surfaces for receiving light entering said third edge.

10        6.        The device of Claim 1 wherein said light directing elements are positioned to cause light to leak out of said light guide only in areas corresponding to pixel positions.

15        7.        The device of Claim 1 wherein said light directing elements are arranged in columns to coincide with columns of pixels.

20        8.        The device of Claim 1 wherein said light guide includes lenses for collimating light exiting said light guide.

25        9.        The device of Claim 8 wherein there is one lens per pixel in said display.

30        10.       The device of Claim 1 further comprising a plurality of layers comprising:  
             a first polarizing filter;  
             an energizing array;  
             a liquid crystal layer; and  
             a second polarizing filter.

35        11.       The device of Claim 10 wherein said energizing array is a thin film transistor array.

40        12.       The device of Claim 10 wherein said plurality of layers lacks a color filter.

45        13.       A method performed by a color liquid crystal display, said display comprising a plurality of layers including a liquid crystal layer and a backlight comprising at least one light guide having a first surface, an opposing second surface, and a plurality of edges; at least one red light emitting diode (LED) optically coupled to a first

- edge of said light guide; at least one green LED optically coupled to a second edge of said light guide; and at least one blue LED optically coupled to a third edge of said light guide, said light guide including light directing elements, a first set of light directing elements causing light entering said first edge to be reflected to exit said first surface in areas corresponding to red pixels in said display, a second set of light directing elements causing light entering said second edge to be reflected to exit said first surface in areas corresponding to green pixels in said display, and a third set of light directing elements causing light entering said third edge to be reflected to exit said first surface in areas corresponding to blue pixels in said display, said method comprising:
- 10 energizing said red light emitting diode (LED) optically coupled to said first edge of said light guide;
  - energizing said green LED optically coupled to said second edge of said light guide;
  - energizing said blue LED optically coupled to said third edge of said light
  - 15 guide; and
  - selectively controlling said liquid crystal layer to display an image comprising a combination of red, green, and blue light.
14. The method of Claim 13 wherein said plurality of layers comprises a first
- 20 polarizing filter, a thin film transistor array, said liquid crystal layer, and a second polarizing filter, said selectively controlling said crystal layer comprising:
  - selectively activating transistors in said thin film transistor array.
15. A device comprising:
- 25 a backlight for a color liquid crystal display comprising:
  - at least one light guide having a first surface and an opposing second surface;
  - a light emitting diode (LED) emitting light having a wavelength equal to or less than blue light, said LED being optically coupled to said light guide;
  - 30 a plurality of first areas on said first surface of said light guide having a first phosphor material that, when irradiated by light emitted by said LED, generate a red light;

a plurality of second areas on said first surface of said light guide having a second phosphor material that, when irradiated by light emitted by said LED, generate a green light; and

5 deformities formed in said light guide directing light from said LED toward said first surface, said red light and green light emitted by said first areas and said second areas coinciding with red and green pixels in said display.

16. The device of Claim 15 wherein said LED emits blue light.

10 17. The device of Claim 15 further comprising third areas on said first surface of said light guide having a third phosphor material that, when irradiated by light emitted by said LED, generates a blue light.

15 18. The device of Claim 17 wherein said LED emits ultraviolet light.